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Measurement of the Energy Scattering Time in GaAs and Low-Temperature Grown GaAs Using the Probe-probe Method,* A.F. BELLO, D.J. ERSKINE, H.B. RADOUSKY, S.N. FOCHS, T.R. DITMIRE, M.D. PERRY, R.P. MARIELLA, M.A. EMANUEL Lawrence Livermore National Laboratory,--A variation of the pump-probe technique is used to determine the energy scattering time in GaAs and low temperature (LT)-grown GaAs. Whereas the pump-probe technique uses unequal laser pulse intensity or energy to pump (excite) and probe the carriers, equal laser pulses are used in the probe-probe method. This method generates a symmetric data set that allows precise determination of zero delay. This yields less errors in the data analysis, especially when the laser pulsewidth is equal to or even greater than the rates being measured. Transmission measurements through the micron thick samples are made with laser pulses of energy just above the band gap (1.43eV). A custom built Ti:Sapphire laser produces the 30 fs pulses, which provides better resolution than previous work using this method.[1,2] The data analysis considers the polarizations of the pulses, the transition matrix elements between bands, and the sample as a saturable absorber. From the data analysis an estimate of the momentum scattering or dephasing time is presented.

[1]H.B. Radousky, et. al., Proc. of the MRS 325, 389 (1994).
[2]C.L. Tang and D.J. Erskine, Phys.Rev.Lett. 51, 840 (1983).

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